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UNITED STATES DEPARTMENT OF AGRICULTURE

Pure-seed Production of Egyptian-type Cotton

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INTRODUCTION

The demand for cotton that is suitable for the manufacture of certain fine fabrics, the exceptionally strong thread required by garment manufacturers, and other goods for which American upland cotton is not well adapted, has been supplied mainly by Egyptian cotton imported from Egypt. A portion of the market requirement has been met by cottons of Egyptian type developed in the United States, and in recent years to a very limited extent by the revival of sea-island cotton culture. The present uncertain shipping situation occasioned by the war and the demand for cotton of this type induced by the war program indicate need for producing an adequate supply of fine cotton in the United States, as cotton from Egypt of similar quality may not be obtainable in quantities sufficient for the needs of American manufacturers.

The Egyptian-type cotton that is now grown almost exclusively in the southwestern United States is S x P, the older Pima variety having very nearly disappeared from cultivation. In the trade, however, S x P is often known as Pima.

The quality of the Egyptian-type cotton crop depends to a large extent on the purity of the planting seed, as well as the care expended in cultivation, picking, and ginning. Pure seed was provided for Arizona growers without particular difficulty from 1912 to 1922, during which period only varieties of this type were grown commercially in the Salt River Valley. But, in 1922, trial plantings of upland cotton amounting to 4,300 acres proved successful, resulting in the planting of 60,000 acres the following year, as compared with 43,000 acres of the Egyptian type variety Pima (*7*).[1] This threat to the production of Pima was recognized immediately, and measures to prevent deterioration of the seed stock through hybridization or mixture were adopted (*3*).[2]

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[1] Italic numbers in parentheses refer to Literature Cited, p. 20.

The following account shows the ill effects of upland contamination on Egyptian-type cotton and describes the methods employed in maintaining supplies of pure seed. Up to the present, all planting seed of S x P cotton has been produced in Arizona, but the industry is expanding and similar problems soon will confront growers in southern New Mexico and southwestern Texas, where S x P is now cultivated in districts that formerly were planted entirely with upland cotton. Although large quantities of Acala (upland) planting seed have been imported into Arizona from California, much pure seed of that variety has been produced in Arizona under similar difficulties and by methods like those used in the production of Egyptian-type seed (*8*).

STABILITY OF THE VARIETIES

The initial purity of the Egyptian-type varieties grown in the Southwest aided materially in preventing deterioration of the stocks. No perceptible change occurred in the Pima variety after 22 years of commercial culture, during which period the stock was replaced only once and then merely to take advantage of a strain with superior fiber (*8, pp. 41–45*).

The varieties were stabilized by strict inbreeding, the best individual plant having been selected each year as the immediate progenitor of the plants that were grown the following year. This method, known as line breeding, was followed in each instance until the variety had been inbred for at least five generations (*3*). Finally, of course, self-pollinated seeds from several of the better sister plants were bulked and planted for increase. There is no satisfactory evidence that cotton varieties developed by line breeding "run out," except through contamination with other cotton (*3*).

The Yuma variety was grown commercially in the Salt River Valley, Ariz., from 1912 to 1918. This variety apparently was less uniform than any of its successors (*2*), and offtype plants appeared rather frequently in the seed-increase fields. Roguing parties in 1914, 1915, and 1916 removed in those years, respectively, 105, 85, and 170 aberrant plants per acre. The Pima variety, which supplanted Yuma after 1918, not only was superior in other respects but also was more stable. Although Pima fields were rogued according to more stringent standards than those employed with Yuma, the number of offtype individuals was only 21 per acre in 1916, 42 in 1917, 20 in 1919, 20 in 1920, 6 in 1921, and 6 in 1922 (*3*). The last pure seed of the Pima variety was produced in 1939, as Pima has been almost entirely replaced by S x P. S x P, first grown commercially in 1933, and Earlipima, a variety that has not yet been grown commercially, appear to be as stable as Pima. With the exception of hybrids, the few rogues that occur in these varieties have a strong tendency toward sterility (fig. 1) and consequently cause little concern.[3] If it

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[2] The procedures recommended by Kearney are quoted, as follows:

"Unquestionably, the occurrence of another type of cotton in the Salt River Valley makes it necessary to use all possible care in the future handling of the Pima seed supply. The uniformity of the variety can be maintained in spite of this peril, but only by keeping all other cotton out of the district which supplies the certified seed and by using none but certified seed for planting the crop. If these precautions are taken, there is no reason to fear that the value of the product will decline."

[3] Although such plants rarely set bolls, they should be removed, since it has been demonstrated that similar rogues in sea-island and upland cottons produce fertile pollen (*10*).

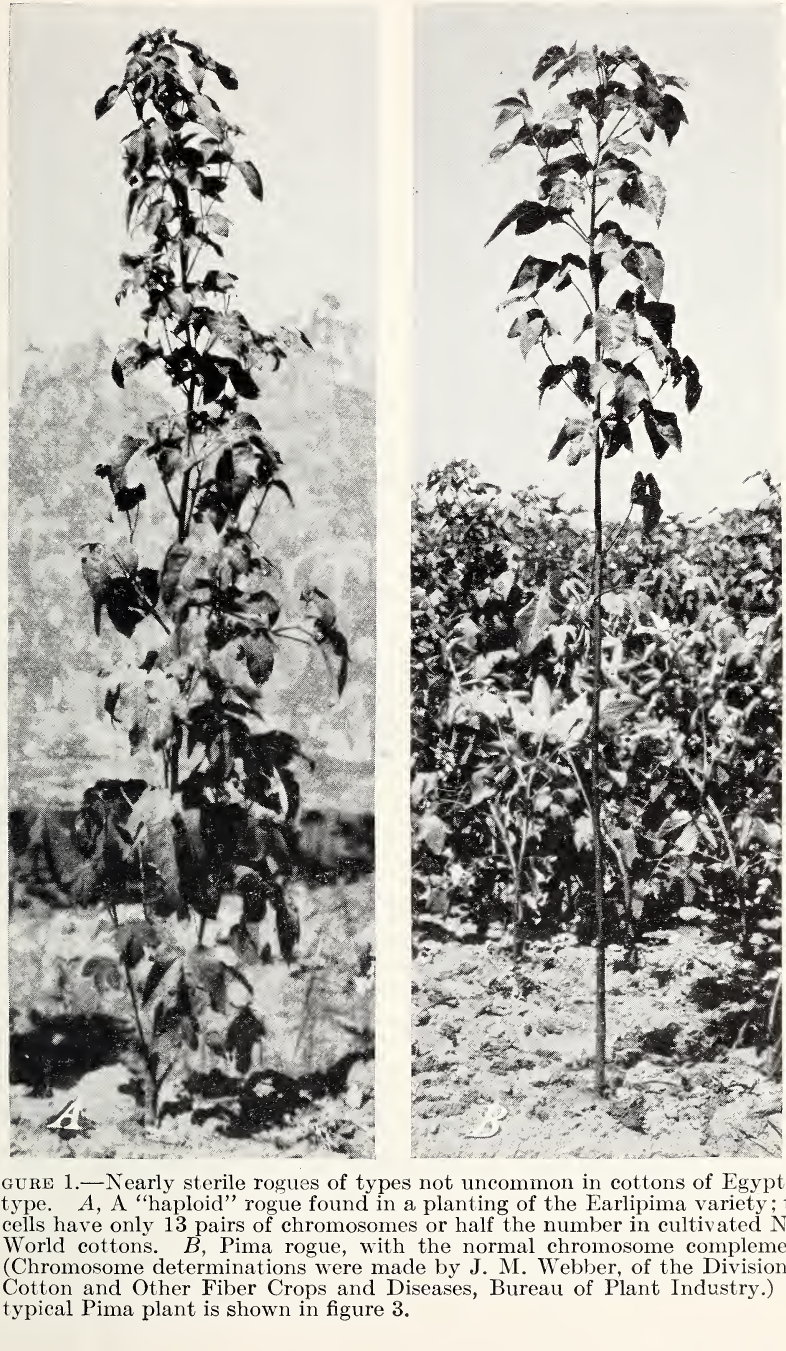

Figure 1.—Nearly sterile rogues of types not uncommon in cottons of Egyptian type. *A*, A "haploid" rogue found in a planting of the Earlipima variety; the cells have only 13 pairs of chromosomes or half the number in cultivated New World cottons. *B*, Pima rogue, with the normal chromosome complement. (Chromosome determinations were made by J. M. Webber, of the Division of Cotton and Other Fiber Crops and Diseases, Bureau of Plant Industry.) A typical Pima plant is shown in figure 3.

were not for contamination with upland cotton, roguing of Egyptian-type cotton probably could be discontinued without material harm resulting.

Representative bolls of the four varieties of Egyptian type mentioned in the preceding paragraph are illustrated in figure 2. A boll of the Egyptian variety Sakel (Sakellaridis) also is shown, as this variety was utilized as a parent in the origination of both S x P (Sakel x Pima) and Earlipima (Pima x S x P).

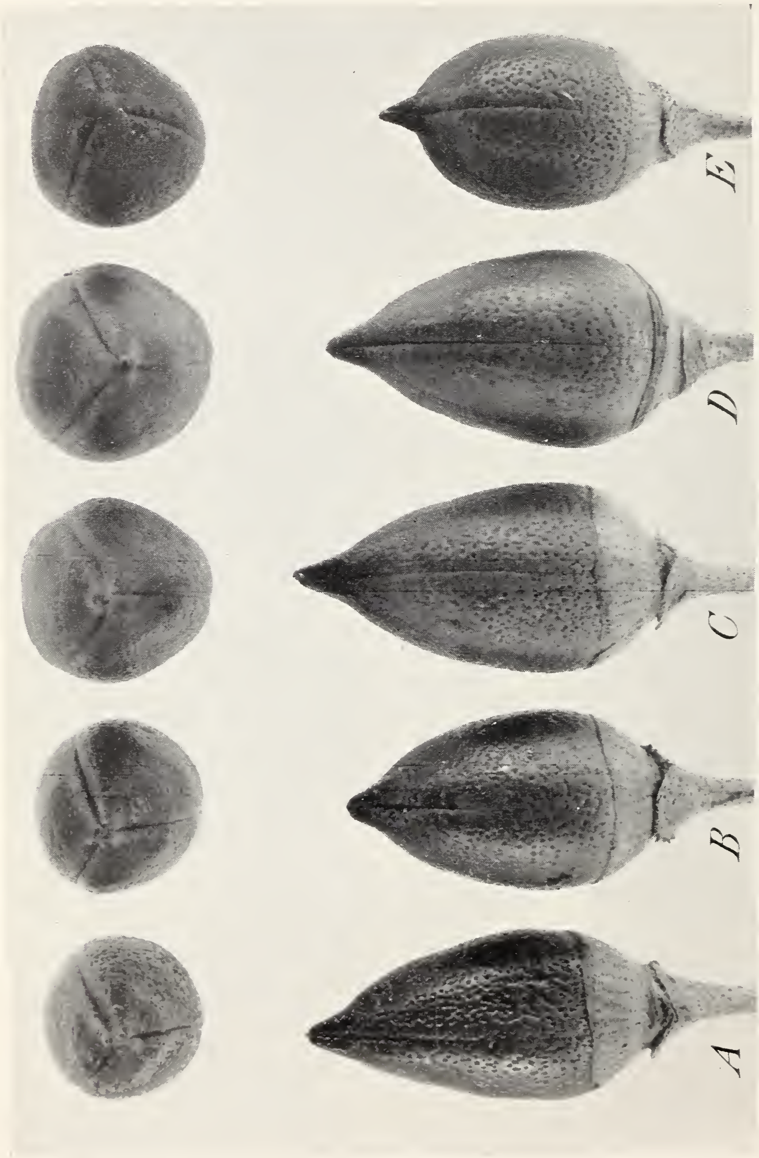

FIGURE 2.—Bolls of four varieties of Egyptian-type cotton: *A*, Yuma, *B*, Pima, *C*, S x P, *D*, Earlipima, and *E*, the Egyptian variety Sakel, one of the parents of both S x P and Earlipima. (Natural size.)

ILL EFFECTS OF HYBRIDIZATION

The two principal kinds of cotton now grown in Arizona, Egyptian type (S x P) and upland, are very unlike, belonging to two distinct botanical species, a fact that in large measure accounts for the success achieved in maintaining stocks of pure seed. The long-staple S x P requires a roller gin, whereas saw ginning suffices for the shorter staple upland cotton. The two types of ginning machinery are housed in separate buildings, usually in separate establishments, and consequently very little mixture of seeds occurs at the gins. Mixture of seeds from any source is readily detected in the fields the following season, as also are the conspicuous first-generation hybrids resulting from natural crossing. In practice, the seed-increase fields are thoroughly rogued, the hybrids and other extraneous plants being removed before they have flowered to an extent that could cause a harmful amount of cross-pollination.

The need of keeping Egyptian-type stocks free of contamination with upland cotton cannot be overemphasized. The very different characteristics of the lint of the two species makes mixture exceedingly objectionable, and admixture of upland or uplandlike lint is likely to lead to discrimination against S x P cotton, under normal trade conditions, in favor of the imported Egyptian cottons.

In table 1, the two kinds of cotton and the first-generation hybrid are compared in respect to several of the more outstanding characters. Some of the differences are illustrated in figures 3, 4, 5, and 6. The present comparison is based on differences between the Pima and Acala varieties, but holds good, in the main, for all Egyptian-type varieties as contrasted with the standard varieties of upland cotton. The characteristics of both species of cotton are discernible in varying degree in plants of hybrid origin.

Hybrid plants of the first generation (fig. 3) are uniformly large, vigorous, fruitful, and usually conspicuous in plantings of either parental species. Unfortunately, the first-generation hybrids do not breed true. In succeeding generations size, vigor, and yielding capacity decrease, abnormalities appear (*5*), and great diversity (figs. 7 and 8) replaces the uniformity that characterizes the first generation.

Progenies of first, second, and third hybrid generations have been grown at Sacaton in recent years in order to demonstrate the deleterious effects of hybridization. Data obtained by analysis of seed-cotton samples collected from the progenies in 1940 are presented in table 2. The tabulated data show the deterioration following the first generation of this hybrid. The third generation, especially, is characterized by small bolls, sparse fiber, and low lint percentage. The great variation in the second- and third-generation populations is reflected in the large values for the coefficient of variation.

The vigor, fruitfulness, and abundant long lint of first-generation hybrids between upland and Egyptian-type cottons have stimulated the expenditure of much effort to develop a superior cotton from such a hybrid. However, the data given in table 2 explain why such efforts have been unsuccessful.

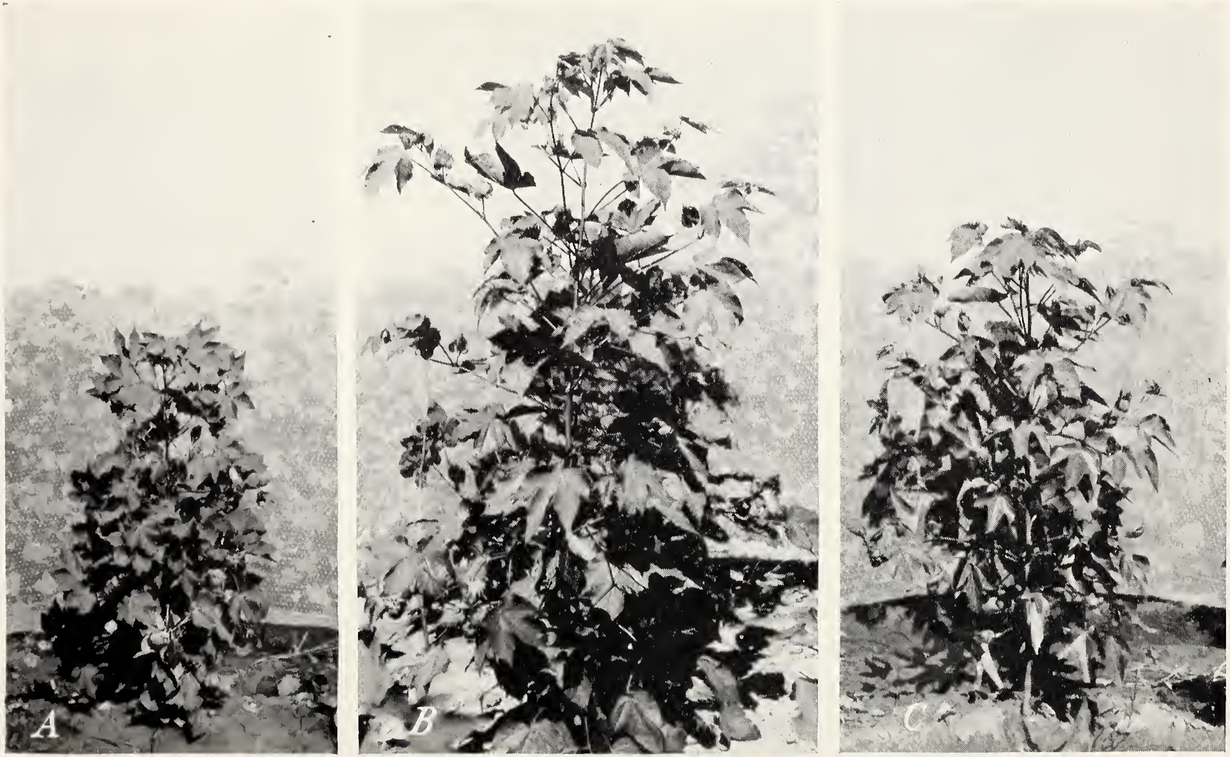

FIGURE 3.—Comparison of cotton plants: *A*, Upland, Acala variety; *B*, first-generation hybrid, showing the large size; and *C*, Egyptian type, Pima variety.

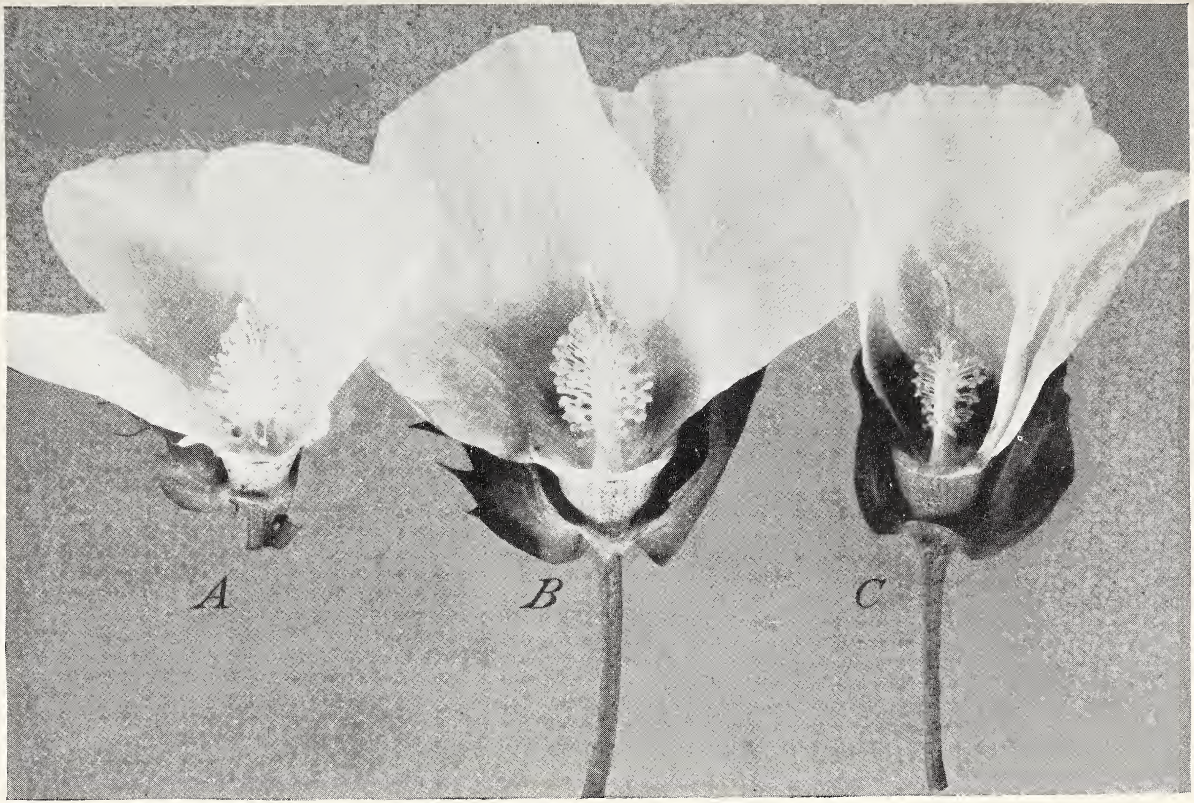

Figure 4.—Flowers of (*A*) upland, (*B*) first-generation hybrid, and (*C*) Egyptian type. Note the absence of basal petal spots in the upland flower and the intermediate development in the hybrid, as compared with the intense spots of the Egyptian flower. ($^{8}/_{10}$ natural size.)

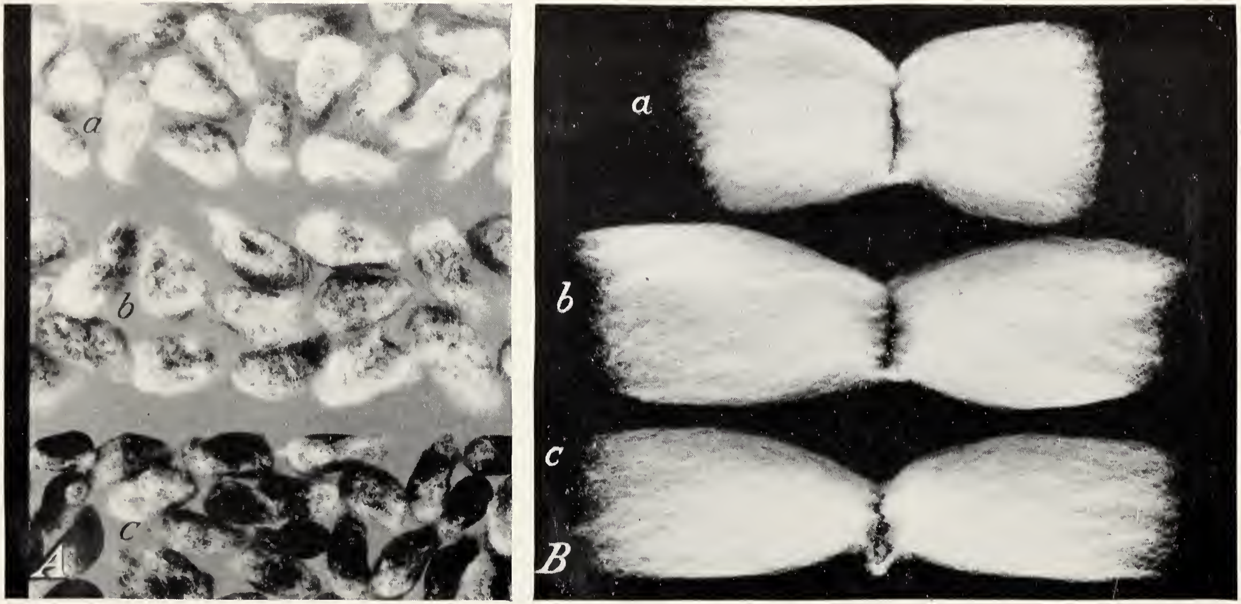

FIGURE 5.—*A*, Ginned seeds: *a*, Upland cotton, Acala variety; *b*, the first-generation hybrid; and *c*, Egyptian type, Pima variety. *B*, Single seed of each kind with fiber combed to show comparative length and abundance: *a*, Upland; *b*, first-generation hybrid; and *c*, Egyptian-type cotton. (Natural size.)

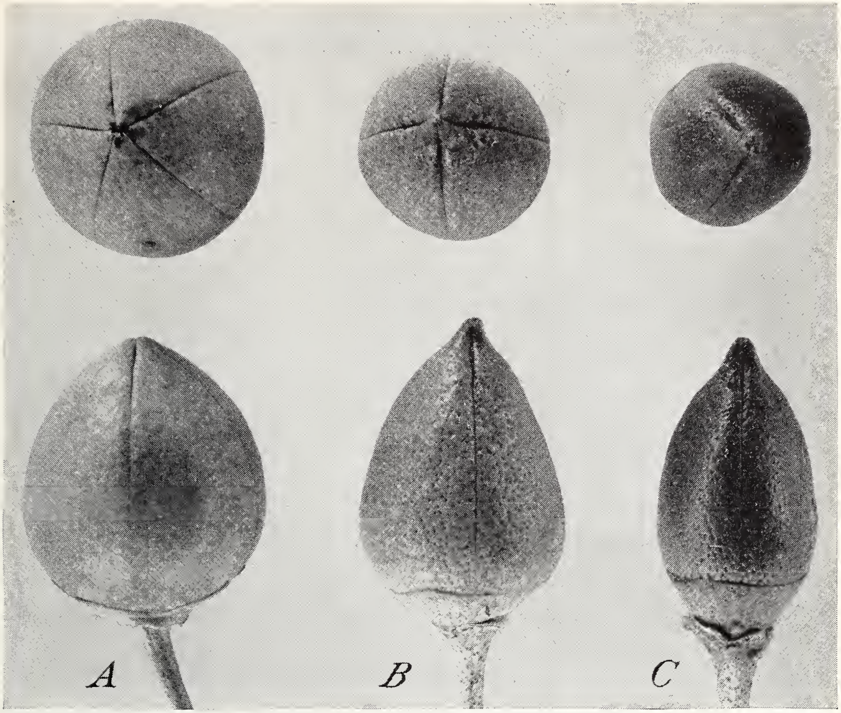

Figure 6.—Bolls of (*A*) upland, (*B*) the first-generation hybrid, and (*C*) Egyptian type. Note the intermediate character of the hybrid boll in respect to size, shape, pitting, and color. (8/10 natural size.)

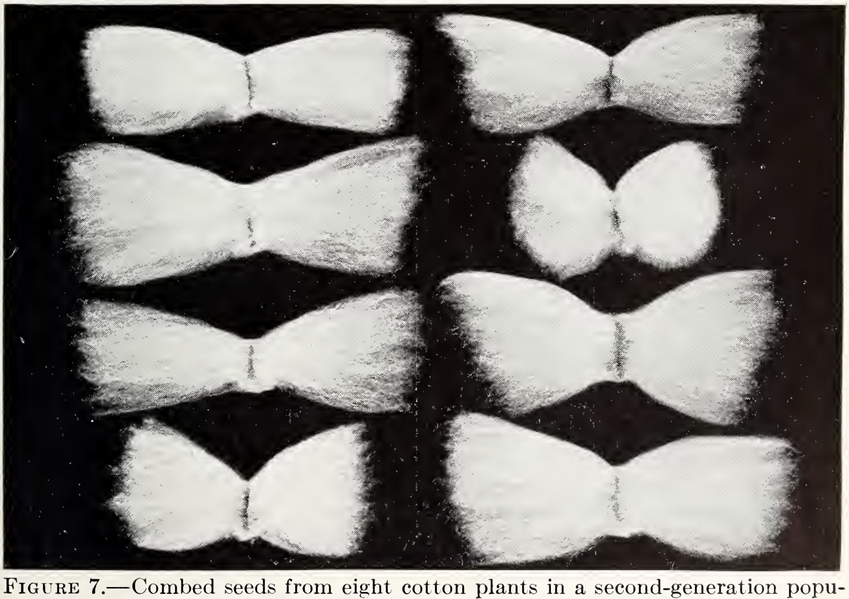

Figure 7.—Combed seeds from eight cotton plants in a second-generation population of an Egyptian-type x upland cross. Note the variation in length and abundance of the fiber. (2/3 natural size.)

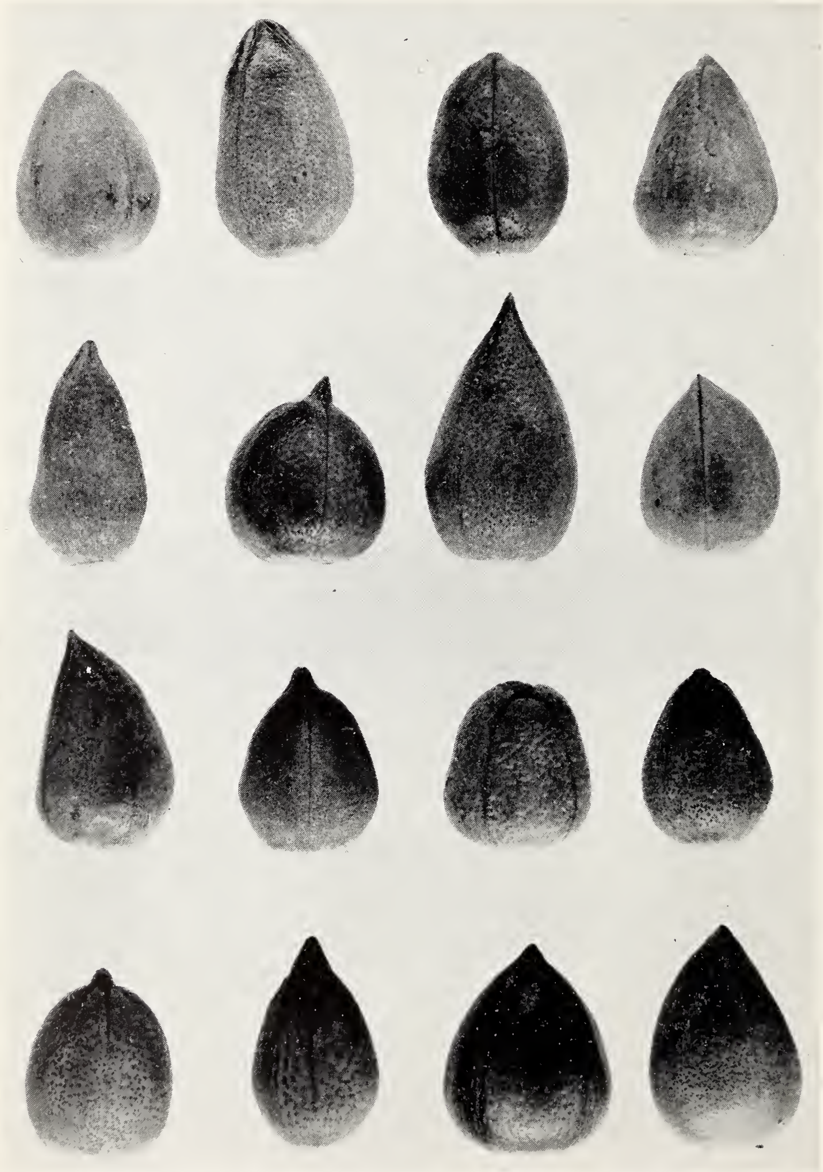

FIGURE 8.—Bolls from 16 plants in a second-generation population of an Egyptian-type x upland cotton cross. The bolls vary greatly in size, shape, color, and character of the surface. (¾ natural size.)

TABLE 1.—*Some of the characteristics of upland and Egyptian-type cottons, as observed under normal conditions in Arizona. Comparative characteristics of the first-generation hybrid are given as an aid in identification of such rogues in pure-seed plantings*

Type and variety	Character					
	Plant	Leaves	Flowers	Bolls	Seeds	Lint
Upland:						
Acala	Short (2 to 4 feet high), with short internodes and short fruiting branches.	Shallowly lobed, of soft texture, softly hairy, olive green, somewhat crinkled on the margin, the callus at base of the blade bright red.	Shallowly cup-shaped, cream-colored, without petal spots, the pedicel shorter than the flower.	Large, roundish, blunt, 4- or 5-locked, pale green, not pitted.	Completely and uniformly covered with grayish white fuzz.	White, dull, abundant, rarely longer than $1\frac{3}{16}$ inches.
Egyptian type:						
Pima	Tall (4 to 8 feet), with long internodes and long fruiting branches.	Deeply lobed, of leathery texture, smooth, grayish green, not crinkled on the margin, the callus normally only slightly reddish.	Deeply cup-shaped, bright yellow, with conspicuous maroon spots at base of the petals, the pedicel about as long as the flower.	Small, tapered, sharp-pointed, 3- or 4-locked, dark green, pitted.	Fuzzy mainly at the ends, dark-colored except where fuzzy, the fuzz more or less green.	Buff-tinted, lustrous, fine, strong, comparatively sparse, $1\frac{7}{16}$ to $1\frac{5}{8}$ inches long.
First-generation hybrid.	Taller than the Egyptian-type parent, somewhat bushy.	Intermediate in lobation, color, and color of callus, crinkled on the margin, larger than the leaves of either parent.	Larger than the flowers of either parent, intermediate in conformation, petal color, and intensity of the petal spots, the pedicel long.	Intermediate in all characters.	Larger than in either parent, completely covered with long, greenish fuzz.	Nearly white, more or less intermediate in luster and abundance, resembling in length Egyptian-type parent.

TABLE 2.—*Analysis of seed-cotton samples collected from 1940 progenies*

[Samples collected at the United States Department of Agriculture Field Station, Sacaton, Ariz.]

Kind and variety of cotton	Plants in the population	Number of bolls per pound of seed cotton		Coefficient of variation	Weight (grams) of fiber from 100 seeds (lint index)		Coefficient of variation	Lint percentage		Coefficient of variation	Staple length (eighths of an inch)		Coefficient of variation
		Mean	Range		Mean	Range		Mean	Range		Mean	Range	
Egyptian type:	*No.*												
S x P	24	146	(131–166)	6.6	5.5	(5.2–6.0)	4.0	29.0	(27.7–31.1)	2.8	12.3	(11.8–12.7)	1.9
Pima	18	167	(154–190)	5.9	4.5	(4.0–4.9)	4.8	24.6	(22.9–26.2)	3.1	12.9	(12.5–13.5)	1.8
Upland:													
Acala	14	66	(61–70)	4.1	7.3	(7.0–7.9)	4.1	37.1	(36.0–38.0)	1.8	8.9	(8.2–9.2)	3.3
Egyptian type x upland (Pima x Acala):													
First generation	11	95	(83–111)	9.6	6.6	(6.1–7.2)	4.6	27.8	(26.0–29.8)	4.0	13.5	(13.0–14.0)	2.1
Second generation	35	158	(104–262)	22.7	5.1	(3.6–6.8)	15.8	26.6	(17.9–34.1)	13.9	12.3	(9.8–14.9)	8.7
Third generation	31	234	(119–482)	38.7	3.7	(1.5–5.5)	22.5	23.7	(13.0–33.3)	15.4	11.9	(10.2–13.6)	6.4

GIN-RUN SEED

Although the quality of Egyptian-type planting seed has been maintained at a high standard (*6, pp. 26–29*), the quantity has not always been sufficient. Planters in some years have been forced, through shortage of good planting seed, to resort to gin-run seed that ordinarily would be sent to the oil mills. A serious shortage in 1940 resulted in probably half of the total acreage being planted with gin-run seed, whereas, in other years, for example 1930, as much as 90 percent of the acreage has been planted with pure seed (*8*).

The impurity of ordinary unprotected cottonseed tends to be very great under normal conditions in Arizona, where both Egyptian-type and upland cottons are cultivated, often in adjacent fields. In 1940, 23 seed samples were collected from 18 different gins. Two of the samples contained no recognizable offtype seeds, but in the other 21 samples offtype seeds ranged from 0.20 to 4.47 percent (table 3). The average proportion of offtype seeds per sample was 0.91 percent. Test plantings made in 1941 showed that 87 percent of the offtype seeds developed into upland or hybrid plants. Therefore, the average proportion of inherently offtype seeds in the gin-run samples amounts to 0.79 percent. Contamination of this magnitude (79 per 10,000) is 39 times the proportion of offtype plants allowed by the rules of the Arizona Crop Improvement Association in fields designated for production of certified planting seed and 390 times the maximum contamination allowed for fields in which registered seed is produced.[4] A sample of gin-run Egyptian-type cottonseed is illustrated in figure 9. The sample that is figured contained offtype seeds in the proportion of 135 in 10,000.

TABLE 3.—*Contamination of ordinary gin-run Egyptian-type cottonseed with offtype (mostly upland or hybrid) seeds*

[The samples were collected in 1940 from 18 ginning establishments in southern Arizona]

Rank of sample	Total seeds in sample	Off-type seeds	Offtype seeds per sample as a percentage of the total number per sample	Rank of sample	Total seeds in sample	Off-type seeds	Offtype seeds per sample as a percentage of the total number per sample
	Number	*Number*	*Percent*		*Number*	*Number*	*Percent*
1	6, 320	0	0	14	5, 761	52	0. 90
2	5, 716	0	0	15	9, 071	87	. 95
3	5, 488	11	0. 20	16	5, 283	57	1. 07
4	8, 164	22	. 27	17	9, 906	115	1. 16
5	6, 424	19	. 29	18	5, 355	72	1. 34
6	4, 866	16	. 33	19	1, 335	18	1. 35
7	7, 300	29	. 40	20	14, 241	195	1. 37
8	4, 775	19	. 40	21	13, 208	214	1. 62
9	5, 417	24	. 44	22	11, 628	200	1. 72
10	10, 936	62	. 56	23	9, 394	420	4. 47
11	6, 545	39	. 59				
12	9, 293	66	. 71				
13	8, 883	74	. 83	Average percentage			. 91

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[4] Arizona growers customarily thin cotton to a stand of approximately 10,000 plants per acre. Therefore, this number is taken as the basis for discussing seed contamination, for if the contaminated seed were planted the expected number of offtype plants in an acre would equal the number of inherently offtype seeds observed in a lot comprised of 10,000 seeds.

As a check on the amount of contamination found in the random samples of gin-run seed, 3 fields were sampled in 1941 for rogues showing characteristics of upland cotton. The average number of rogues observed in the 3 fields was 72 per acre, or approximately 0.72 percent. This compares closely with the contamination in the seed samples, in which the proportion of inherently offtype seeds averaged 0.79 percent.

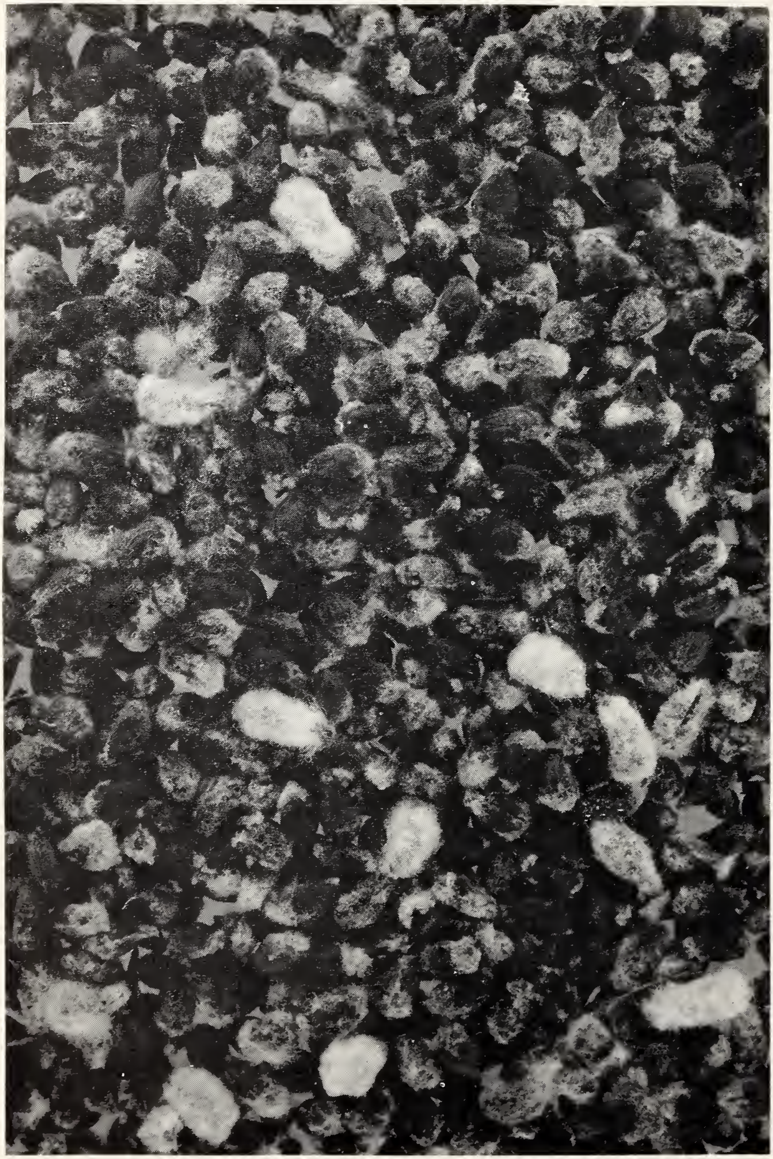

FIGURE 9.—A sample of gin-run Egyptian-type cottonseed. The white, fuzzy seeds are apparently from upland cotton or of hybrid origin. In the sample represented by this figure (sample No. 19, table 3), offtype seeds were found in the proportion of 135 in 10,000. (Natural size.)

Growers who plant gin-run seed, especially those who use their own unprotected seed year after year, probably do not realize how much deterioration takes place under such practice, or the harm done to the reputation of all Egyptian-type cotton.

ARIZONA SEED ASSOCIATIONS

The Salt River Valley Egyptian Cotton Growers' Association, organized in 1914, was the first general organization to look after the maintenance of a supply of pure seed for the entire Salt River Valley (*9*). The most active local organization was the Tempe Exchange, which handled the ginning, storage, and distribution of pure planting seed in the large pure-seed district that was located in the vicinity of Tempe. After the Tempe Exchange was dissolved about 1924, the entire function of supervising the maintenance of pure-seed stocks was assumed by the Maricopa County Farm Bureau Pure Seed Association (*8*). The business of this organization was handled by a small group composed of pure-seed growers and public agricultural service officials and was known as the pure-seed committee.

In 1937, the pure-seed committee affiliated with the Arizona Crop Improvement Association. The last organization has taken over much of the responsibility for producing and distributing seed and in addition has extended pure-seed production to cotton districts outside Maricopa County. Also, the Arizona Crop Improvement Association has established regulations for producing and labeling cottonseed that are as consistent as possible with regulations governing other seed crops in Arizona and other States. These regulations were published in 1940.[5]

For the past several years actual control of pure-seed production of Egyptian-type cotton has been in the hands of a few private growers. Because of the speculative aspects of the pure-seed business, resulting from annual fluctuations in acreage, private control sometimes leads to shortage or high prices. A well-financed growers' association, controlling production and distribution, can afford to carry surplus seed from one year to the next and, by doing so, prevent shortages. An additional advantage of cooperative management is the feasibility of stabilizing the price of pure planting seed at a comparatively low level based on oil-mill prices.

CLASSIFICATION OF PLANTING SEED

Egyptian-type planting seed falls into two main categories: (1) That which is replanted from year to year and thus continued as a source of pure seed, and (2) that which is used to produce only one commercial crop. According to the rules of the Arizona Crop Improvement Association,[5] parent stocks and foundation stocks belong in the first category, certified seed in the second. Registered seed may fall into either classification depending on whether it is properly protected and saved for future production of pure seed or sent to the oil mill after being used to produce one crop. Parent and foundation stocks are grown under official control (fig. 10), but the increase from these stocks is planted by private growers who are engaged in the production of registered seed.

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[5] UNIVERSITY OF ARIZONA. COTTON. RULES AND REGULATIONS FOR PRODUCING SEED UNDER THE PROGRAM OF THE ARIZONA CROP IMPROVEMENT ASSOCIATION. Rev. ed. 1940. [Processed.]

Detailed rules are given concerning the following points: (1) Fees paid by pure-seed growers, (2) classification of planting seed, (3) isolation, crop history, and roguing and inspection of fields, (4) inspection and tagging at gins, (5) delinting, recleaning, and disinfecting seed, (6) germination tests, (7) final tagging and sealing of sacks, and (8) color of tags for each class of seed. Also, the four classes of approved planting seed (parent stock, foundation stock, registered, and certified) are defined.

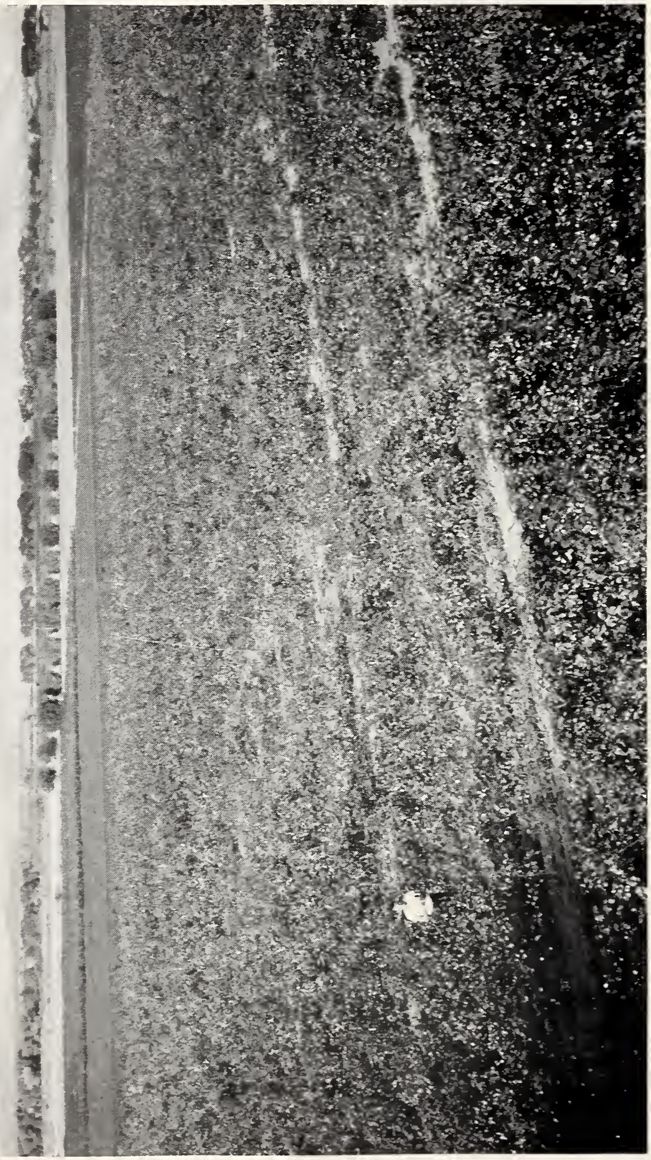

FIGURE 10.—View of an isolated field used for increasing seed of the Earlipima variety. Seed farm, United States Field Station, Sacaton, Ariz., 1940.

Fields in which certified seed is produced are eligible for approval if they are located not less than one-half mile from other varieties and contain not more than 2 harmful rogues per acre. The standards for the other classes of seed-increase fields are more strict; minimum isolation of 1 mile is required, and roguing must be continued until final inspection reveals an average contamination of not more than 1 hybrid or other harmful rogue in 5 acres, or approximately 1 rogue in 50,000 plants.

PROCEDURE FOR MAINTAINING PURE SEED

The cardinal points in the pure-seed procedure since the advent of upland cotton culture in Arizona are (1) isolation of plantings to prevent excessive cross-pollination with other varieties, particularly those of upland cotton, (2) planting on clean land, (3) roguing of the seed-increase fields to eliminate upland plants, hybrids, and other harmful rogues, and (4) prevention of accidental seed mixture. The work in all phases has been carried on from the beginning as a cooperative effort among growers, ginners, the University of Arizona, and the Bureau of Plant Industry.

Isolation of Pure-seed Fields

Cross-pollination in cotton is effected by insects, mainly honeybees and other Hymenoptera. The percentage of cross-fertilized seeds varies greatly according to the proximity of other varieties of cotton and the abundance of pollinating insects (*4*). As a control measure against natural crossing, isolated fields are selected for producing planting seed.

Although isolation is recognized as essential to the success of pure-seed production in districts where more than one variety of cotton is grown, it is usually impracticable to provide sufficient isolation to preclude all chance of crossing. The maximum distance traversed by pollinating insects is a matter of conjecture, but evidence obtained in the course of roguing pure-seed fields in Arizona leaves no doubt that insects effect cross-pollination in fields that are 1 mile distant from other cotton.

Growers of pure seed often employ buffer plantings to protect pure-seed fields. The buffer strips, planted with the same kind of cotton as the increase fields, are located so as to attract and intercept pollinating insects that fly from plantings of any other variety.

Planting on Clean Land

In addition to adequate isolation, the immediate crop history of seed-increase fields is a factor that requires consideration. A field that has been planted with cotton the preceding year may contain volunteer plants, and therefore should not be utilized for increasing seed of any other variety.

The isolated seed farm that is operated in conjunction with the United States Department of Agriculture Field Station at Sacaton, Ariz., under cooperative agreement with the Office of Indian Affairs, Department of the Interior, is utilized as the primary source of pure seed of varieties of Egyptian-type cotton (fig. 10). Whenever there is a change of varieties on this farm, the new variety is planted in plots in which cotton was not grown the preceding year.

ROGUING

Roguing is an essential operation in the production of pure planting seed of Egyptian-type cotton (*1*), for under ordinary circumstances it has been found impracticable to prevent a certain amount of natural crossing with other kinds of cotton. Nevertheless, planting seed of excellent quality has been produced annually in spite of this difficulty. Contamination that has not been prevented through isolation and other control procedures has been eliminated by careful roguing of seed fields.

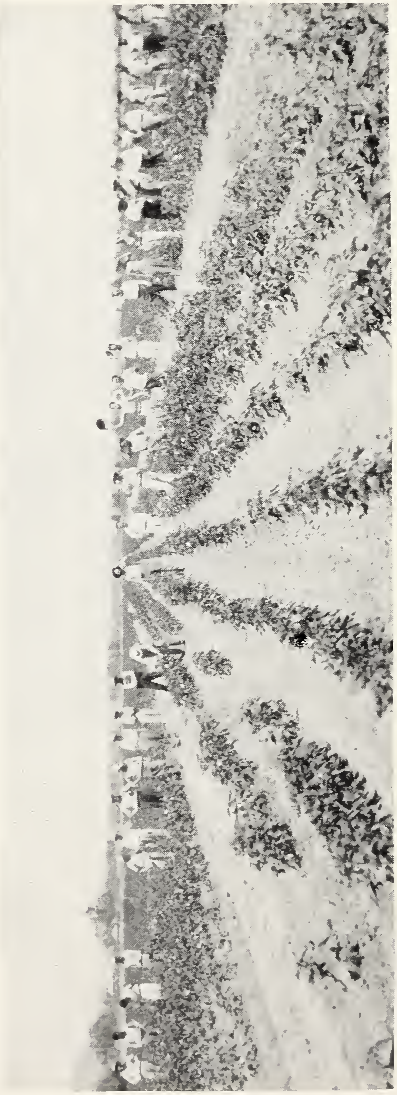

FIGURE 11.—Growers of pure planting seed learning to rogue cotton by actual practice in a field of Pima grown at the seed farm, United States Field Station, Sacaton, Ariz., 1939. Roguing should have been done about 10 days earlier before any flowers had appeared.

Roguing is done in June or early July, as soon as the rogues become distinguishable. For best results, the operation should be completed before the plants flower, but the tendency has been to delay roguing until a few flowers have appeared (fig. 11). Persons who are not lacking in aptitude can be taught in a short time to recognize hybrids and other rogues in the stage immediately preceding the appearance of flowers.

Roguing parties should place all plants that are pulled up at the ends of the rows where a supervisor can examine them in respect to both number and character. Thorough roguing cannot be accomplished if more than two rows of plants are viewed simultaneously by any one member of the party. Every rogue should be pulled up by the roots. A rogue that is merely cut off will produce sprouts that may flower in time to contaminate the pure stock.

An illustration of a first-generation Egyptian-type x upland hybrid is shown in figure 3. Two sterile rogues are illustrated in figure 1.

Preventing Seed Mixture

In order to prevent accidental introduction of seeds of other kinds of cotton, great care must be exercised in the handling of planting seed from the time the seed cotton is picked until the seed is sacked and sealed. If preventive measures are not taken, mixture may occur in various ways, of which the more important are: (1) In picking sacks carried from other cottonfields, (2) in wagons or trailers previously used to haul seed cotton of another variety, (3) in storage bins, gin stands, seed and seed-cotton conveyors, overhead cleaners, pneumatic elevators, distributors, and other parts of the ginning equipment, (4) in sacks previously used for cottonseed, and (5) in delinting and disinfecting apparatus.

The pure-seed association may accept responsibility for preventing mixture. Trained inspectors can be of great assistance to the growers and ginners by advising them how to prevent seed mixture in the handling operations.

SUMMARY

A brief history of the production of pure planting seed in Arizona and a description of the methods employed are presented in this circular as an aid to growers and officials who are concerned with the cultivation of the Egyptian type of cotton.

The cultivation of Egyptian-type cotton in the southwestern United States is expanding, and it is anticipated that a corresponding increase in the production of pure planting seed will be necessary.

The quality of Egyptian-type cotton is seriously impaired by contamination with upland cotton, either through mixture of seeds or hybridization. For this reason, ordinary gin-run seed should not be saved for planting in districts where upland cotton also is cultivated.

Although both types of cotton have been cultivated for many years in Arizona, pure-seed stocks have been maintained. This has been accomplished by isolation and roguing of the seed fields and alertness in preventing accidental mixture of seeds.

The success achieved in maintaining pure-seed stocks under such conditions is also attributable to the initial purity of the Egyptian-type varieties and to the fact that the Egyptian and upland types of cotton are very unlike.

Mixture of seeds seldom occurs at the gins, as the two types of cotton require different ginning machinery.

Natural crossing that is not prevented by isolation of seed fields is readily detected the following year by the appearance of conspicuous first-generation hybrids, which are removed in roguing operations before they have produced enough flowers to effect more than a negligible amount of cross-pollination.

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